***QUES:- Which of the following languages is regular?***

* ***L1 = {0n1n | n < 10}***

***– L2 = {0n1n | n > 10}***

***A) L1 B) L2 C) Both L1 and L2 D) Neither L1 nor L2***

**Correct answer is (A):** Only L1. Because it is a finite language (of size 10).

-DFAs can count up to 10

-DFAs can count up to any fixed bounded number k, given enough states.

- But they cannot count indefinitely: – Given a long enough string 0000000000...0, they will loose count when they “run out” of states

***Ques:- Let L = L1∩L2, where L1 and L2 are languages as defined below:(Gate-2009)***

***L1 = {***a^{m}b^{m}ca^{n}b^{n}***| m, n >= 0 }***

***L2 = {***a^{i}b^{j}c^{k}***| i, j, k >= 0 } Then L is***(A) Not recursive  
(B) Regular  
(C) Context free but not regular (yes)  
(D) Recursively enumerable but not context free.  
Explanation: The language L1 accept strings {c, abc, abcab, aabbcab, aabbcaabb, …} and L2 accept strings {a, b, c, ab, abc, aabc, aabbc, … }. Intersection of these two languages is  L1 ∩ L2 = {akbkc | k >= 0 } which is context free, but not regular.

***QUES:- If a grammar is not LALR(1), Yacc will produce one or more multiply defined entries in the parsing table action function. These entries are reported as shift/reduce conflicts or reduce/reduce conflicts***

***Ques:- Which one of the following is not a Greibach Normal form grammar?(NET-JUNE-2012)***

(i) S -> a | bA | aA | bB

A -> a

B -> b

(ii) S -> a | aA | AB

A -> a

B -> b

(iii) S -> a | A | aA

A -> a

(A) (i) and (ii)

(B) (i) and (iii)

(C) (ii) and (iii)(Ans)

(D) (i), (ii) and (iii)

***QUES:- If the parse tree of a word w generated by a Chomsky normal form grammar has no path of length greater than i, then the word w is of length***

(A) no greater than 2i+1 (B) no greater than 2i

(C) no greater than 2i–1(yes) (D) no greater than i.

Chomsky normal forms. A->BC. Where B,C are variables.

Or

A->a.(terminal) Where as Greibach NF

A->aV1V2—Vk  where k>=0. A is a terminal and Vi is a variable.

Let the following Chomsky grammar.

A->BC. B->BC. C->AC A->AB.

A->a B->b C->c..

While making a parse tree, it is observed that.

When path is of length 1. It has the  form like A->a.   its length of word is 1.

When path  is of length 2. It has the form A-> AB->ab. Or Or A->BC->bc. Its length of word is 2.

When path is of length 3. It has the form A->AB->ABBC->abbc its length is of 4.

So it is generalized as path of length i, word will be of length 2i-1.

***QUES:- Which of the following is the most general phase structured grammar?***

(A) Regular (B) Context-sensitive(yes)

(C) Context free (D) None of the above

***QUES:- The family of context sensitive languages is \_\_\_\_\_ under union and \_\_\_\_ under reversal***

a)closed, not closed b)not closed, not closed

c)closed, closed(yes) d)not closed, closed

***QUES:- Which of the following statements is false?***

a)Every context-sensitive language is recursive

b)The set of all languages that are not recursively enumerable is countable(yes)

c)The family of recursively enumerable language is closed under union

d)The families of recursively enumerable and recursive languages are closed under reversal

***QUES:-The symmetric difference of two sets S1 and S2 is defined as***

***S1ΘS2 = {x|xϵS1 or xϵS2, but x is not in both S1 and S2}***

***The nor of two languages is defined as***

***nor (L1,L2) = {w|w ∉ L1 and w|w ∉ L2}***

Which of the following is correct?

(A) The family of regular languages is closed under symmetric difference but not closed under nor.

(B) The family of regular languages is closed under nor but not closed under symmetric difference.

(C) The family of regular languages are closed under both symmetric difference and nor.(yes)

(D) The family of regular languages are not closed under both symmetric difference and nor.

***QUES:- Given a Turing Machine M = ({q0, q1}, {0, 1}, {0, 1, B}, d, B, {q1}) Where d is a transition function defined as d(q0, 0) = (q0, 0, R) d(q0, B) = (q1, B, R)The language L(M) accepted by Turing machine is given as :***

(1) 0\* 1\* (2) 00\*(yes) (3) 10\* (4) 1\*0\*

***QUES:-Which of the following pairs have different expressive power ?***

(1) Single-tape-turing machine and multi-dimensional turing machine.

(2) Multi-tape turing machine and multi-dimensional turing machine.

(3) Deterministic push down automata and non-deterministic pushdown automata.(yes)

(4) Deterministic finite automata and Non-deterministic finite automata

***Given the following statements :***

(i) The power of deterministic finite state machine and nondeterministic finite state machine are same.

(ii) The power of deterministic pushdown automaton and nondeterministic pushdown automaton are same.

Which of the above is the correct statement(s) ?

(A) Both (i) and (ii) (B) Only (i)(yes) (C) Only (ii) (D) Neither (i) nor (ii)

***QUES:-Which of the following statements is false ?***

(1) Every context-sensitive language is recursive.

(2) The set of all languages that are not recursively enumerable is countable.(yes)

(3) The family of recursively enumerable languages is closed under union.

(4) The families of recursively enumerable and recursive languages are closed under reversal

***QUES:-Given the following statements :***

(i) Recursive enumerable sets are closed under complementation.

(ii) Recursive sets are closed under complementation.

Which is/are the correct statements ?

(A) only (i) (B) only (ii)(yes) (C) both (i) and (ii) (D) neither (i) nor (ii)

***QUES:- Which is not the correct statement?***

(A) The class of regular sets is closed under homomorphisms.

(B) The class of regular sets is not closed under inverse homomorphisms.(yes)

(C) The class of regular sets is closed under quotient.

(D) The class of regular sets is closed under substitution

***Which of the following permanent database that has an entry for each terminal symbol ?***

(A) Literal table (B) Identifier table

(C) Terminal table(yes) (D) Source table

***Which of the following statement is true?***

(A) If a language is context free, it can always be accepted by a deterministicpush-down automation

(B) The union of two context free languages is context free(TRUE)

(C) The intersection of two context free languages is context free

(D) The complement of a context free language is context free

***Given an arbitrary non-deterministic finite automata (NFA) with N states, the maximum number of states in an equivalent minimized DFA is at least ———————.***

(A) N^2 (B) 2N(yes) (C) 2N (D) N!

***Assume the statements S1 and S2 given as : Which of the following is true?***

S1 : Given a context free grammar G, there exists an algorithm for determining whether L(G) is infinite.

S2 : There exists an algorithm to determine whether two context free grammars generate the same language.

(A) S1 is correct and S2 is not correct.(yes)

(B) Both S1 and S2 are correct.

(C) Both S1 and S2 are not correct.

(D) S1 is not correct and S2 is correct.

***Consider the following two languages : Which of the following is true ?***

L1 = {an bl ak | n + l +k>5 }

L2 = {an bl ak |n>5, l >3, k≤ l }

(A) L1 is regular language and L2 is not regular language.(yes)

(B) Both L1 and L2 are regular languages.

(C) Both L1 and L2 are not regular languages.

(D) L1 is not regular language and L2 is regular language.

***Given the following two languages :***

***L1 = {an bn | n ≥ 0, n ≠ 100}***

***L2 = {w ∈ {a, b, c}\*| na(w) = nb(w) = nc(w)}***

Which of the following options is correct ?

(1) Both L1 and L2 are not context free language

(2) Both L1 and L2 are context free language.

(3) L1 is context free language, L2 is not context free language.(yes)

(4) L1 is not context free language, L2 is context free language

***Which of the following are not regular ?***

(A) Strings of even number of a’s.

(B) Strings of a’s, whose length is a prime number.

(C) Set of all palindromes made up of a’s and b’s.

(D) Strings of a’s whose length is a perfect square.

(1) (A) and (B) only (2) (A), (B) and (C) only

(3) (B), (C) and (D) only (yes) (4) (B) and (D) only

***Consider the languages L1 = φ and L2 = {1}. Which one of the following represents L1\* ∪ L2\* L1\* ?***

(1) {∈} (2) {∈, 1} (3) φ (4) 1\*(yes)

***Given the following statements :***

***(A) A class of languages that is closed under union and complementation has to be closed under intersection.***

***(B) A class of languages that is closed under union and intersection has to be closed under complementation.***

Which of the following options is correct ?

(1) Both (A) and (B) are false. (2) Both (A) and (B) are true.

(3) (A) is true, (B) is false.(yes) (4) (A) is false, (B) is true.

***Which is not the correct statement(s) ?***

(i) Every context sensitive language is recursive.

(ii) There is a recursive language that is not context sensitive.

(A) (i) is true, (ii) is false.

(B) (i) is true and (ii) is true.(yes)

(C) (i) is false, (ii) is false.

(D) (i) is false and (ii) is true.

***If the parse tree of a word w generated by a Chomsky normal form grammar has no path of length greater than i, then the word w is of length***

(A) no greater than 2i+1 (B) no greater than 2i

(C) no greater than 2i–1(yes) (D) no greater than i

***Given the following statements :***

(i) Recursive enumerable sets are closed under complementation.

(ii) Recursive sets are closed under complementation.

Which is/are the correct statements ?

(A) only (i) (B) only (ii)(yes) (C) both (i) and (ii) (D) neither (i) nor (ii)

***The grammar ‘G1’ S -> OSO| ISI | 0|1|Epsilan and the grammar***

***‘G2’ is S -> as |asb|X, X -> Xa | a. Which is the correct statement?***

(A) G1 is ambiguous, G2 is unambiguous

(B) G1 is unambiguous, G2 is ambiguous(yes)

(C) Both G1 and G2 are ambiguous

(D) Both G1 and G2 are unambiguous

A context-free grammar is said to be an ambiguous grammar if there exists a string which can be generated by the grammar in more than one way (i.e. the string admits more than one parse tree or, equivalently, more than one leftmost derivation).

Any grammar can be proved ambiguous if we are able to find at least one string with more than one left-most derivation accepted by the grammar. In the given question we cannot find any such strings for G1. Consider G2, take the case of aaa, two possible derivations are:

(1) S → aS (2) S → aS

→ aX // Using S→ X →aaS // Using S → aS

→ aXa // Using X→ Xa →aaX // Using S → X

→ aaa // Using X → a →aaa // Using S → a

So G1 is unambiguous and G2 is ambiguous

***Which of the following regular expression identities are true?***

(A) (r + s)\* = r\* s\*

(B) (r + s)\* = r\* + s\*

(C) (r + s)\* = (r\*s\*)\*(yes)l;

(D) r\* s\* = r\* + s\*

***QUES:- Dead-code elimination in machine code optimization refers to :(Net – June-2008)***

(A) Removal of all labels

(B) Removal of values that never get used(yes)

(C)removal of function which are not involved.

(D)removal of a module after its use

***In \_\_\_\_\_\_\_, the bodies of the two loops are merged together to form a***

***single loop provided that they do not make any references to each other.(NET-2016-july)***

(1) Loop unrolling (2) Strength reduction

(3) Loop concatenation (4) Loop jamming(yes)

***Loop unrolling is a code optimization technique:(NET – 2015)***

(A) that avoids tests at every iteration of the loop. (yes)

(B) that improves performance by decreasing the number of instructions in a basic block.

(C) that exchanges inner loops with outer loops

(D) that reorders operations to allow multiple computations to happen in parallel

***Peep-hole optimization is a form of :***

(A) loop optimization (B) local optimization(yes)

(C) constant folding (D) data flow analysis

**Explanation:-**

Characteristics of peephole optimizations:

a) Redundant-instructions elimination

b) Flow-of-control optimizations

c) Algebraic simplifications

d) Use of machine idioms

e) Unreachable

The identification of common sub-expression and replacement of run-time computations by compile-time computations is (TNSET)

1) local optimisation

2) loop optimization

3) constant folding (yes)

4) data flow analysis

***A PDM behaves like a TM when the number of auxiliary memory has***

1) Zero 2) 1 or more 3) 2 or more(YES) 4) None of the above

***Explanation:*** A pushdown automata behaves like a Turing machine when the number of auxiliary memory is 2 or more.

PDA with 2 or more auxiliary memory have same expressive power.

Generally PDA has one auxiliary memory.

***A PDM behaves like a FSM when the number of auxiliary memory has***

1) Zero(yes) 2) 1 or more 3) 2 or more 4) None of the above

***Let G1 and G2 be arbitrary context free languages and R an arbitrary regular language. Consider the following problems : (ugc – 2020 – june )***

***(A) Is L(G1 ) = L(G2 )?***

***(B) Is L(G2) <= L(G1 )?***

***(C) Is L(G1 ) = R?***

***Which of the problems are undecidable? (june – 2020)***

Choose the correct answer from the options given below:

(1) (A) only (2) (B) only (3) (A) and (B) only

(4) (A), (B) and (C)(Ans)

***Consider the following problems : (Dec-2018)***

***(i) Whether a finite state automaton halts on all inputs ?***

***(ii) Whether a given context free language is regular ?***

***(iii) Whether a Turing machine computes the product of two numbers ?***

***Which one of the following is correct ?***

(1) Only (i) and (iii) are undecidable problems

(2) Only (i) and (ii) are undecidable problems

(3) Only (ii) and (iii) are undecidable problems (true)

(4) (i), (ii) and (iii) are undecidable problem

**Explanation:-**

Whether a finite state automation halts on all inputs.

Whether a given context-free language is regular. UnDecidable. [ Regularity is decidable till DCFL class]

A Turing machine computes the products of two numbers, UNDECIDABLE, Even though we can design a TM for calculation product of 2 numbers but here it is asking whether given TM computes product of 2 numbers, so the behavior of TM unknown hence, Undecidable.

***Quest:- Given below are two statements:***

***Statement-I : The problem "Is L1 ^ L2 = ? " is undecidable for context sensitive languages L1 and L2***

***Statement-II : The problem "Is W  L?" is decidable for context sensitive language L, (where W is a string).***

***In the light of the above statements, choose the correct answer from the options given below***

(1) Both Statement-I and Statement-II are true (yes)

(2) Both Statement-I and Statement-II are false

(3) Statement-I is correct but Statement-II is false

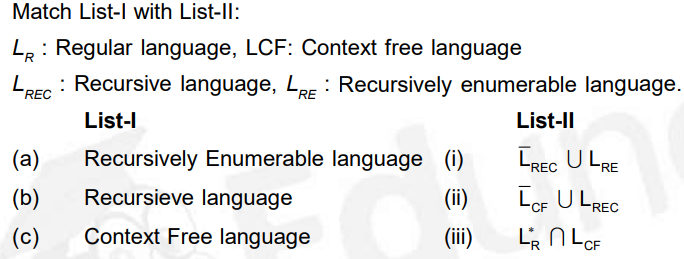
(4) Statement-II is incorrect but Statement-II is true

***Quest:- If every string of a language can be determined, whether it is legal or illegal in finite time, the language is called***

1) decidable(true), 2)undecidable, 3)interpretive, 4)noninterpretive

***Let L1 and L2 be languages over  = {a, b} represented by the regular expressions (a\* + b)\* and (a + b)\* respectively. Which of the following is true with respect to the two languages? (UGC – July -2020 )***

(1) L1  L2 (2) L2  L1 (3) L1 = L2 (yes) (4) L1 intersection L2 = 



Choose the correct answer from the options given below :

(1) (a)-(ii), (b)-(iii), (c)-(i) (2) (a)-(iii), (b)-(i), (c)-(ii)

(3) (a)-(i), (b)-(ii), (c)-(iii) (yes) (4) (a)-(ii), (b)-(i), (c)-(iii)

***Let w be any string of length n is {0,1}\*. Let L be the set of all substrings of w. What is the minimum number of states in a non-deterministic finite automaton that accepts L? (gate 2010)***  
**(A)** n-1 **(B)** n **(C)** n+1 (yes) **(D)** 2n-1  
  
**Explanation:** We need minimum n+1 states to build NFA that accepts all substrings of a binary string. For example, following NFA accepts all substrings of “010″ and it has 4 states.

***The grammar A→AA∣(A)∣ϵ is not suitable for predictive-parsing because the grammar is: (Gate – 2005 , NET – 2018 – DEC)***

A)Ambiguous B) left-recursive

C) right-recursive D)an operator-grammar

**Explanation:-**both **A** and **B** can be answers but **A** is a better answer. Because we have standard procedure for removing left-recursion but ambiguity is not easy to remove. - checking if a given CFG is ambiguous is a undecidable problem

***Let L1 and L2 be any context-free language and R be any regular language. Then, which of the following is correct ? (UGC – NET – 2018 – DEC ) Gate - 2017***

I. L1 ∪ L2 is context-free II. L1' is context-free

III. L1-R is context-free IV. L1 ∩ L2 context-free

**(A)** I, II and IV only **(B)** I and III only(yes) **(C)** II and IV only **(D)** I only

**Explanation:-**

1. CFL is not closed under Intersection
2. CFL is not closed under complementation
3. CFL is closed under union
4. CFL is closed under Intersection with Regular Language
5. Regular Language is closed under complementation

***Shift-reduce parser consists of (NET 2019 - JULY)***

a)input buffer b)stack c)parse table

Choose the correct option from those given below:

1)a and b only 2)a and c only 3)c only

4)a, b and c (yes)

***Consider the languages L1 = φ and L2 = {1}. Which one of the following represents L1 \* ∪ L2 \* L1 \* ? (NET – 2017- Jan – Gate – 2013 )***

(1) {∈} (2) {∈, 1} (3) φ (4) 1\*(yes)

***Explanation*:**

L1 = ϕ, and L2 = {1}

L1 \* is also ϕ

L2\* will be 1\*

so L1\* U L2\* L1\* = 1\*

NOTE: ϕ is empty language. Concatenation ϕ with any other language is ϕ.

NOTE: ϕ\* = ∈

Ref: <https://www.youtube.com/watch?v=M4OXaT87nWg&ab_channel=MonalisaCS>

***The set A={ 0n 1n 2n | n=1, 2, 3, ……… } is an example of a grammar that is: (NET - JULY - 2018)***

(A) Context sensitive(yes) (B) Context free (C) Regular (D) None of the above

Explanation: Here we need more than one stack to compare all the string having equal number of 1’s , 2’s and 3’s simultaneously.

Since this given language is context sensitive language. It is neither regular language nor context free language.

***Let w be any string of length n is {0,1}\*. Let L be the set of all substrings of w. What is the minimum number of states in a non-deterministic finite automaton that accepts L? (Gate - 2010)***

(A) n-1 (B) n (C) n+1 (yes) (D) 2n-1

**Explanation:** We need minimum n+1 states to build NFA that accepts all substrings of a binary string. For example, following NFA accepts all substrings of “010″ and it has 4 states.

**The minimum number of states of the non-deterministic finite automation which accepts the language {a b a bn|n**  **0}**  **{a b an|n**  **0} is (NET - 2012 Dec)**

(A) 3 (B) 4 (C) 5(yes) (D) 6

**The language accepted by a Pushdown Automation in which the stack is limited to 10 items is best described as (Gate - 2002)**

(A) Context Free

(B) Regular (yes)

(C) Deterministic Context Free

(D) Recursive

Ref <https://www.geeksforgeeks.org/gate-gate-cs-2002-question-7/>

A bottom-up parser generates : (NET - 2018 - JULY)

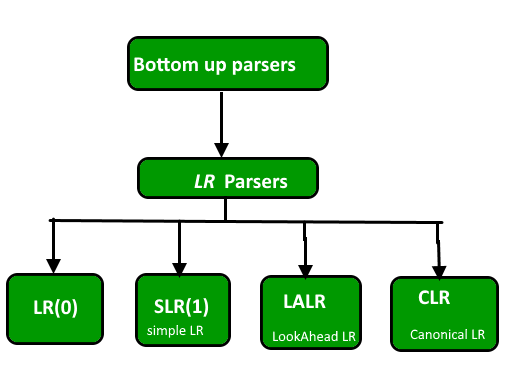
(1) Left-most derivation in reverse

(2) Right-most derivation in reverse(yes)

(3) Left-most derivation

(4) Right-most derivation

Explanation:-



A general shift reduce parsing is LR parsing. The L stands for scanning the input from left to right and R stands for constructing a rightmost derivation in reverse.

Ref <https://www.geeksforgeeks.org/bottom-up-or-shift-reduce-parsers-set-2/>

Consider the following statements( ) : (NET - 2018)

S1 : There exists no algorithm for deciding if any two Turing machines M1 and M2 accept the same language.

S2 : The problem of determining whether a Turing machine halts on any input is undecidable.

Which of the following options is correct ?

(1) Both S1 and S2 are correct(yes)

(2) Both S1 and S2 are not correct

(3) Only S1 is correct

(4) Only S2 is correct

**Consider the languages L1 = ϕ, and L2 = {1}. Which one of the following represents L1\* U L2\* L1\* ?**

(1) {ε} (2) {ε,1} (3) ϕ (4) 1\*(yes)

Explanation for the above 2 questions:-

pi is considered as 0

epsilon is considered as 1

epsilon is included in anything power \*

pi power zero is epsilon

L1\* U L2\* L1\* = pi\* U 1\* pi\*

= ε U 1\* ε = 1\*

Ref: <https://www.youtube.com/watch?v=uIR2r2Xd1v4>

**Consider the languages L1 = ϕ and L2 = {a}. Which one of the following represents L1 L2\* U L1\* (gatecs2013)**

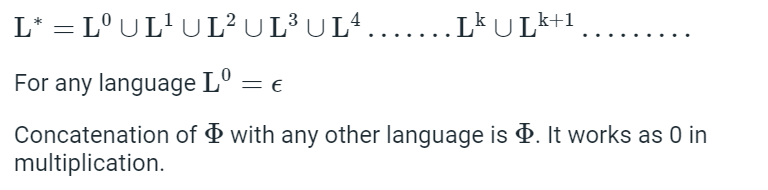
Image

(A) A (yes) (B) B (C) C (D) D

**Explanation:-**

ϕ a\* U ϕ\* = ϕ a\* U ε = ϕ U ε = ε

Points to Remember



{ϕ} indicates an empty language. Concatenation of ϕ with any other language is ϕ. It works as 0 in multiplication.

L1\* = ϕ\* which is {ε}.

Union of ϕ and {ε} is {ε}

***Which of the following statements is true? (NET - oct - 2020)***

The union of two context free languages is context free

The intersection of two context free languages is context free(yes)

The complement of a context free language is context free(yes)

If a language is context free, it can always be accepted by a deterministic pushdown automaton

Explanation:-

Ref https://gateoverflow.in/349644/Ugcnet-oct2020-ii-29

Intersection of any language (Regular , DCFL , CFL , CSL , RC , RE) with Regular language is definitely closed.

Regular INTERSECT Regular -------- Regular

DCFL INTERSECT Regular----------- DCFL

CFL INTERSECT Regular---------- CFL

CSL INTERSECT Regular ----------CSL

Recursive INTERSECT Regular --------- Recursive

Recursively Enumerable INTERSECT Regular --------- Recursively Enumerable

the first L stands for scanning the input from left to right,

the second L stands for producing a leftmost derivation,

and the 1 stands for using one input symbol of lookahead at each step to make parsing action decision.

A language is said to be LL(1) if it can be generated by a LL(1) grmmar. It can be shown that LL(1) grammars are

not ambiguous and

not left-recursive.